

Oblique Aerial Photography of the Arctic Coast of Alaska, Cape Sabine to Milne Point, July 16–19, 2009



USGS Lat: 70.641333 Lon: -160.040500 UTC: 01:57:46 18 Jul 2009 DSC 5736.JPG

Data Series 503

U.S. Department of the Interior
U.S. Geological Survey

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By Ann E. Gibbs and Bruce M. Richmond

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Introduction

The Arctic Coastal Plain of northern Alaska, an area of strategic economic importance to the United States, is home to remote Native American communities and encompasses unique habitats of global significance. Coastal erosion along the Arctic coast is chronic and widespread; recent evidence suggests that erosion rates are among the highest in the world (as high as ~16 m/yr) and may be accelerating (Mars and Houseknecht, 2007; Jones and others, 2008). Coastal erosion adversely impacts energy-related infrastructure, natural shoreline habitats, and Native American communities. Climate change is thought to be a key component of recent environmental changes in the Arctic (Hinzman and others, 2005). Reduced sea-ice cover in the Arctic Ocean is one of the probable mechanisms responsible for increasing coastal exposure to wave attack and the resulting increase in erosion (Reimnitz and Maurer, 1979; Jorgenson and Brown, 2005). Extended periods of permafrost melting and associated decreases in bluff cohesion and stability are another possible source of the increase in erosion.

Several studies of selected areas on the Alaska coast document past shoreline positions and coastal change, but none have examined the entire North coast systematically (Harper, 1978; Reimnitz and others, 1985, 1988; Barnes and others, 1992; Mars and Houseknecht, 2007; Jones and others, 2008). Results from these studies indicate high rates of coastal retreat that vary spatially along the coast. To address the need for a comprehensive and regionally consistent evaluation of shoreline change along the North coast of Alaska, the U.S. Geological Survey (USGS), as part of their Coastal and Marine Geology Program's (CMGP) National Assessment of Shoreline Change Study, is evaluating shoreline change from Peard Bay to the United States/Canadian border, using historical maps and photography and a standardized methodology that is consistent with other shoreline-change studies along the Nation's coastlines (see, for example, <http://coastal.er.usgs.gov/shoreline-change/>, last accessed February 12, 2010; Hapke and others, 2006).

This is the second in a series of publications containing photographs collected during reconnaissance surveys conducted in support of the National Assessment of Shoreline

Change Study. An accompanying ESRI ArcGIS shape file (and plaintext copy) indicates the position of the aircraft and time when each photograph was taken. The USGS-CMGP Field Activity ID for the survey is A-5-09-AK, and more information on the survey and how to view the photographs using Google Earth software is available online at <http://walrus.wr.usgs.gov/infobank/a/a509ak/kml/a-5-09-ak.photos.kmz> (last accessed February 12, 2010). The initial report "Oblique aerial photography of the Arctic coast of Alaska, Nulavik to Demarcation Point, August 7–10, 2006" (Gibbs and Richmond, 2009) is available online at <http://pubs.usgs.gov/ds/436/>, and the associated Google Earth .kmz file is available at <http://walrus.wr.usgs.gov/infobank/a/a106ak/kml/a-1-06-ak.photos.kmz> (last accessed February 12, 2010).

Survey Information

Nearly 4,800 digital still photographs were taken between Cape Sabine (~450 km southwest of Barrow) and Milne Point (~275 km southeast of Barrow) over three individual survey days, July 16–18, 2009 Alaska daylight time (AKDT). The photographs were georeferenced using global positioning system (GPS) information relative to coordinated universal time (UTC). Because UTC is 8 hours ahead of AKDT, the UTC dates of photography span four days, July 16–19, 2009 (fig. 1; table 1). Data coverage between Barrow and Cape Sabine is continuous. There are gaps in data coverage between Elson Lagoon and the east side of the Ikpikpuk River delta and from the Kogru River to the east side of the Colville River delta. High-definition digital video imagery was collected concurrently but is not included in this data release.

Field operations were based out of Barrow, Alaska. Photographs were collected from a Cessna 185 Skywagon II floatplane (fig. 2), typically at an altitude of about 500 ft (152 m) and approximately 1,000 ft (305 m) offshore, using a 10.2-megapixel Nikon D200 digital camera with a 18–200 mm zoom lens (DSC_iiii.jpg filename format, where "iiii" is an image counter). In general, photographs were taken with the largest field of view; however, the photographer could also zoom in to collect more detailed photographs of features of interest. Because of variable aircraft altitude and distance from

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Table 1. Details from survey A-9-05-AK.

Date (AKDT) July 2009	Date (UTC) July 2009	No. of photographs	Area covered	Image filenames
16	16-17	1,903	Barrow-Nokotlek Point-Elson Lagoon	DSC_1008.jpg-DSC_3766.jpg
17	17-18	2,021	Barrow-Cape Sabine-Barrow	DSC_4005.jpg-DSC_6177.jpg
18	18-19	881	Offshore: Barrow-Milne Point-Barrow; Onshore: Staines River-Milne Point	DSC_6189.jpg-DSC_7134.jpg

the shoreline, as well as variable shooting parameters, the photographs do not cover a consistent geographical width (that is, the absolute scale differs between images).

A Garmin GPSmap 76CSX (WAAS enabled) handheld global positioning system (GPS) unit recorded the position of the aircraft every 2 seconds. Photographs were georeferenced to the aircraft position at the time when the photograph was taken using the Garmin NMEA output and a Nikon MC-35 adapter cable. Photographs were subsequently annotated with position and time information using software and hardware developed by Red Hen Systems (<http://www.redhensystems.com/>, last accessed February 12, 2010) (fig. 3). Photographs were resampled to 2,000x1,339 pixels in Adobe Photoshop.

Photographic and GIS Data

This report includes survey photographs, an Arc-GIS shapefile and comma-separated plaintext file

“A509AK_PhotoLocations,” and metadata files. Attributes include the location of the aircraft (longitude, latitude, altitude) and UTC when each photograph was taken, the image “NAME,” and the field “IMAGE” that denotes the location of the image file.

The imagery included in this report is viewable in multiple ways. Photographs can be opened directly by using any .jpg-compatible image viewer (for example, Windows Picture and Fax Viewer, Quicktime Picture Viewer, Adobe Photoshop, or any Web browser), and thumbnails of images can be viewed directly within Windows Explorer by selecting the “View-Thumbnails” option.

The shapefile “A509AK_PhotoLocations” included with this report facilitates viewing within an ArcMap GIS project. Once the shapefile is added to the project, hyperlinks can be enabled and photographs viewed by using the default .jpg-file image viewer. Images are best viewed in Windows Picture and Fax Viewer or another viewer that provides the ability to scroll backward and forward along the flightline. To maintain the

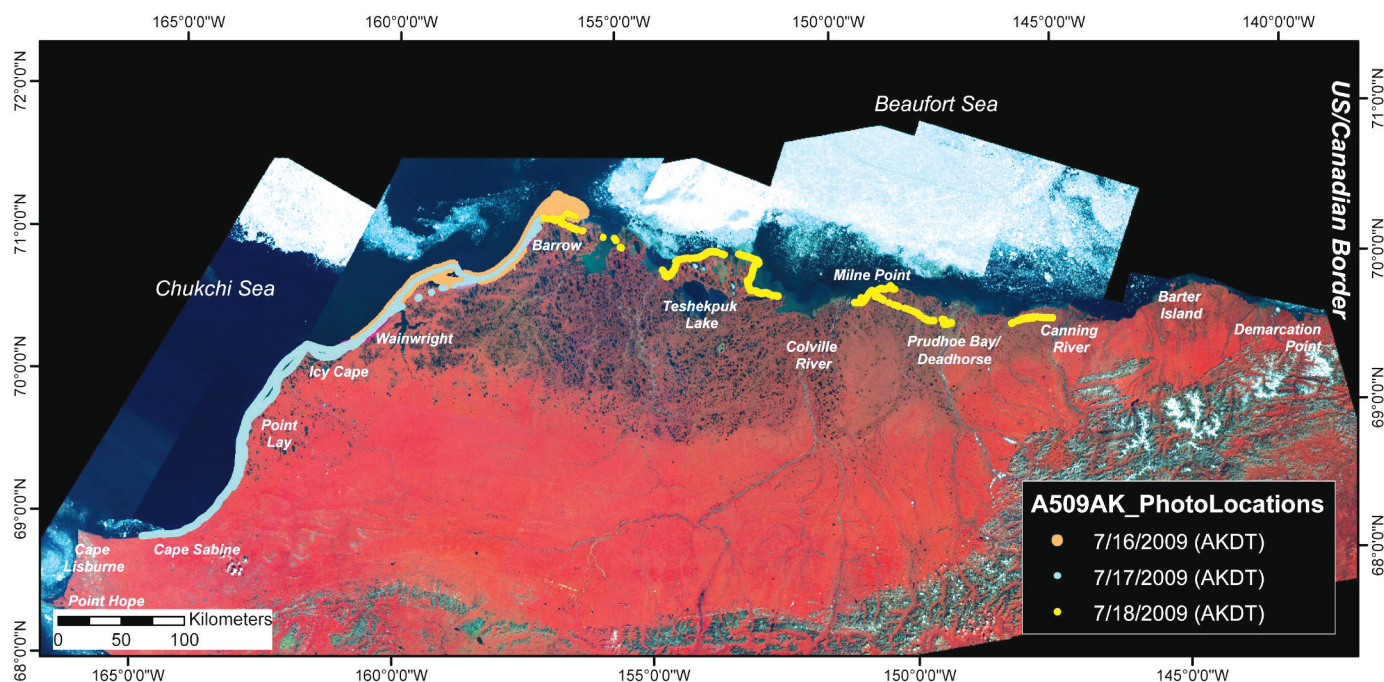


Figure 1. North Slope of Alaska from the United States-Canadian border on the east to the Point Hope on the west showing photographs acquired during survey A-5-09-AK for individual days. Base image is a spectrally enhanced Landsat-MSS mosaic (1977-86 composite), available for download at http://agdc.usgs.gov/data/projects/anwr/datahtml/ns124_mss.html (last accessed February 12, 2010).



Figure 2. Survey platform, Cessna 185 Skywagon II floatplane, piloted by Jim Webster of Fairbanks.



USGS Lat: 70.761667 Lon: -152.324000 UTC: 01:26:42 19 Jul 2009 DSC_6865.JPG

Figure 3. Typical photographic image from survey A-5-09-AK, annotated with location, UTC time and date, and image name.

integrity of hyperlinks if copied to another location, photograph folders should be stored in the same-level folder as the shapefile “A509AK_PhotoLocations.”

To enable hyperlinks, select “IMAGE” as the supported “Hyperlinks” field on the “Display” tab within the “Layer Properties” dialog box for “A509AK_PhotoLocations.” The “Hyperlink base” field in the “Document Properties” dialog box under the “File” menu must also indicate the full path to the files. (For example, if your download drive is labeled “H”, the “Hyperlink base” field should be modified to “H:.”) Once hyperlinks are established, photographs can be viewed by selecting a point with the “Hyperlink” button on the toolbar. Hyperlinked photos can also be accessed by using the “Identify” tool if the “IMAGE” attribute is modified to reflect the full, versus relative, pathname.

Information included in this report is considered public domain and may be freely copied and distributed. Use of appropriate byline/photograph/image credit is requested; suggested credit: photograph by Bruce Richmond/Ann Gibbs, USGS (or U.S. Geological Survey, depending on audience).

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